

## NOTES ON AUSTRALIAN MOSQUITOES (DIPTERA, CULICIDAE).

1. THE LIFE HISTORY OF *AEDOMYIA VENUSTIPES* (SKUSE).

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(One Text-figure.)

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*Synopsis.*

The male, larva and pupa of *Aedomyia venustipes* (Skuse) are described and the female re-described, from specimens collected at Woodside, near Yarram, Victoria.

The larvae and pupae are found chiefly in open, permanent, well-vegetated pools during spring and summer. The larvae are pale green and remain submerged amongst vegetation, and they can spend long periods on the bottom of collecting jars free of vegetation without rising to the surface. The larvae do not appear to have special structures for obtaining oxygen from plants. The pupae are brown in colour and frequently rest amongst surface vegetation and move rapidly through the water like a tadpole with their tails out behind them. Adults have not been collected in the field although numerous attempts have been made to attract them to man and rabbit. Laboratory bred adults feed readily on sugar solution and raisins after emergence. The eggs are unknown.

This species is recorded from the Gippsland and Mallee regions of Victoria, and from the Elizabeth Bay and National Park districts of New South Wales.

Adults of *A. venustipes* can be distinguished from *Aedomyia catasticta* Knab by the scales forming the prominent scutal pattern being short and broad in *venustipes* and long and narrow in *catasticta*; the third hind tarsal segment all white and fifth all dark in *venustipes*, whilst the third white at base and apex, dark in between, and the fifth mostly white in *catasticta*.

AEDOMYIA VENUSTIPES (SKUSE).

*Aedes venustipes* Skuse 1889, Proc. Linn. Soc. N.S.W., (2) 3: 1761. *Aedes* (*Aedomyia*?) *venustipes* Skuse, Theobald, 1901, *Mon. Cul.*, II: 223; *Aedomyia catasticta*, Knab, 1909, *Ent. News*, 20: 387; *Aedomyia squamipennis* Leicester (nec. L-A), 1908, *Cul. Malaya*, p. 182; *Aedomyia venustipes* Edwards, 1924, *Bull. Ent. Res.*, 14: 364.

As can be seen from some of the early publications, Taylor (1914), Edwards (1924, 1929), Mackerras (1937) and Baisas (1938), there has been confusion over the distribution (and specific determination) of *A. venustipes* and *A. catasticta*. It appears, however, that *A. venustipes* is the species found chiefly in southern Australia.

*Types*: Holotype female, collected by Skuse at Elizabeth Bay, Sydney, in 1886, is in the Macleay Museum, Sydney. The allotype male, 3 males and 3 females of this series, 3 morphotype larvae and 3 morphotype pupae from Woodside, are in the collection of the National Museum of Victoria, Melbourne. One male and one female are in each of the following collections: C.S.I.R.O. Division of Entomology, Canberra; School of Public Health and Tropical Medicine, Sydney; Macleay Museum, Sydney; University of Queensland, Brisbane; Queensland Institute of Medical Research, Brisbane; British Museum (Natural History), London, and U.S. National Museum, Washington. The holotype and another female in the National Museum, Melbourne, which bears two labels, 1—"18.11.25 Melbourne, Victoria. G. F. Hill" and 2—"Aedomyia venustipes (Skuse) Id. by G. F. Hill, Nov. '25", were the only adults known prior to the series described in this paper.

The holotype female was examined in November, 1956, and was found to be faded and with many scales and some legs missing. In addition, it was mounted on cardboard and only one side was examined. The Woodside specimens agree with it in the following details: third hind tarsal segment pure white, fifth segment dark; scutal scale patterns and scale types similar; wing scaling apparently similar; and proboscis with bands of white scales medially and at the apex.

*Distinctive Features.*

*Adult*: A medium sized, ornate species, with banded proboscis and tarsi, third hind tarsal segment entirely white, and broad, dark, cream and white scales on wings. To be distinguished from *A. catasticta* Knab by: scales forming the prominent scutal pattern short and broad, in *venustipes*, long and narrow in *catasticta*; third hind tarsal segment all white and fifth all dark in *venustipes*, third white at base and apex, dark in between, and fifth mostly white in *catasticta*.

*Larva*: General coloration is pale green with light brown head siphon and saddle. Hair tufts generally enlarged, giving a hairy appearance. In *venustipes* head hair B consists of 8-9 plumose hairs about three-quarters the length of A, whilst in *catasticta* head hair B is a tuft of 6-7 plumose hairs about half the length of A. In *venustipes* head hair C is a tuft of at least 6 plumose hairs nearly as long as A, whilst in *catasticta* head hair C is a tuft of only 3 plumose hairs. Siphonal index of *venustipes* is at least 3.6, whilst that of *catasticta* is about 3.

*Pupa*: General coloration brown with pigmented areas on trumpet paddles. No Australian pupae of *catasticta* have been described, so comparison with that species cannot be made.

*Allotype Male*: *Head*: Vertex with broad black and white flat and upright scales; a prominent patch of erect, cream and few dark scales medially. Border scales of eyes mostly black and flat, with some white scales. A pair of strong black vertical setae, and a row of fine golden ocular setae. Palpi about one-eighth length of proboscis, black-scaled, with white scales at apex of each segment. Proboscis black-scaled, about one and a quarter times length of hind femur, mottled with white scales dorsally near base; a band of white scales forming a conspicuous ring at middle, and another band near apex. Labella dark. Antennae about two-thirds length of proboscis, the last two segments clothed with short fine hairs; terminal segments about half length of penultimate. Clypeus dark, with patch of white scales dorsally. Torus dark, with some small white scales. *Thorax*: Integument black. Anterior pronotum with broad white scales and a few black scales and numerous hairs. Posterior pronotum with broad black and white scales; lower scales mostly white. Patches of broad white scales on prosternum, upper and lower sterno-pleuron, upper and lower mesepimeron, pre-alar and post-spiracular areas. Pleural bristles dark and pale; 4 dark upper and 4 pale lower sterno-pleurals near posterior margin; 14 pale pre-alar; 8 pale upper and 4 lower mesepimerals; no spiracular or post-spiracular bristles. Scutum black, covered with dark, white and cream scales. On anterior half and dorsally, a broad band of cream scales extends posteriorly to about half length of scutum, with two smaller patches of similar scales continuous with the large patch extending laterally on either side of middle line. Numerous dark acrostichal and dorsocentral bristles, and 8 dark pre-scutellar bristles. Scutellum black, with broad black and white scales, and black scales over apex of each lobe; bristles dark and strong, 6 on inner lobe and 10 on lateral lobes. Metapostnotum dark. *Wings*: Densely covered with broad dark and cream scales, with patches of broad white scales. Costa with three patches of white scales, one near base, one about one-quarter length of wing from base, and one extending posteriorly from tip of SC to form the largest area of white scales on the wing. Cell  $R_2$  about twice length of its stem; cell  $M_1$  about one and a half times length of its stem, the base of  $M_1$  proximal to that of  $R_2$ .  $R_1$  with subcostal and pre-apical areas of white scales;  $R_2$ ,  $R_3$ ,  $M_1$  and  $M_2$  with patches of white scales over bases; small patches of white scales at apices of all veins, and at all forks and crossveins; small pre-apical patch on  $R_{4+5}$  and  $M_{3+4}$ , the latter extending to about half length towards base. Fringe with white scales opposite all veins. Halteres with pale stems and small flat white scales on knobs. Wing length 3.8 mm. *Legs*: Mottled with black and white scales, and with banded tarsi. Coxae of all legs with patches of broad white scales; fore and mid with dark bristles and some fine hairs, hind with fine hairs only. Trochanters white-scaled. Femora with black and white scales, white scales basally and anteriorly, and erect tufts of black and cream scales at apex of mid and hind femora; tibiae mottled with black and

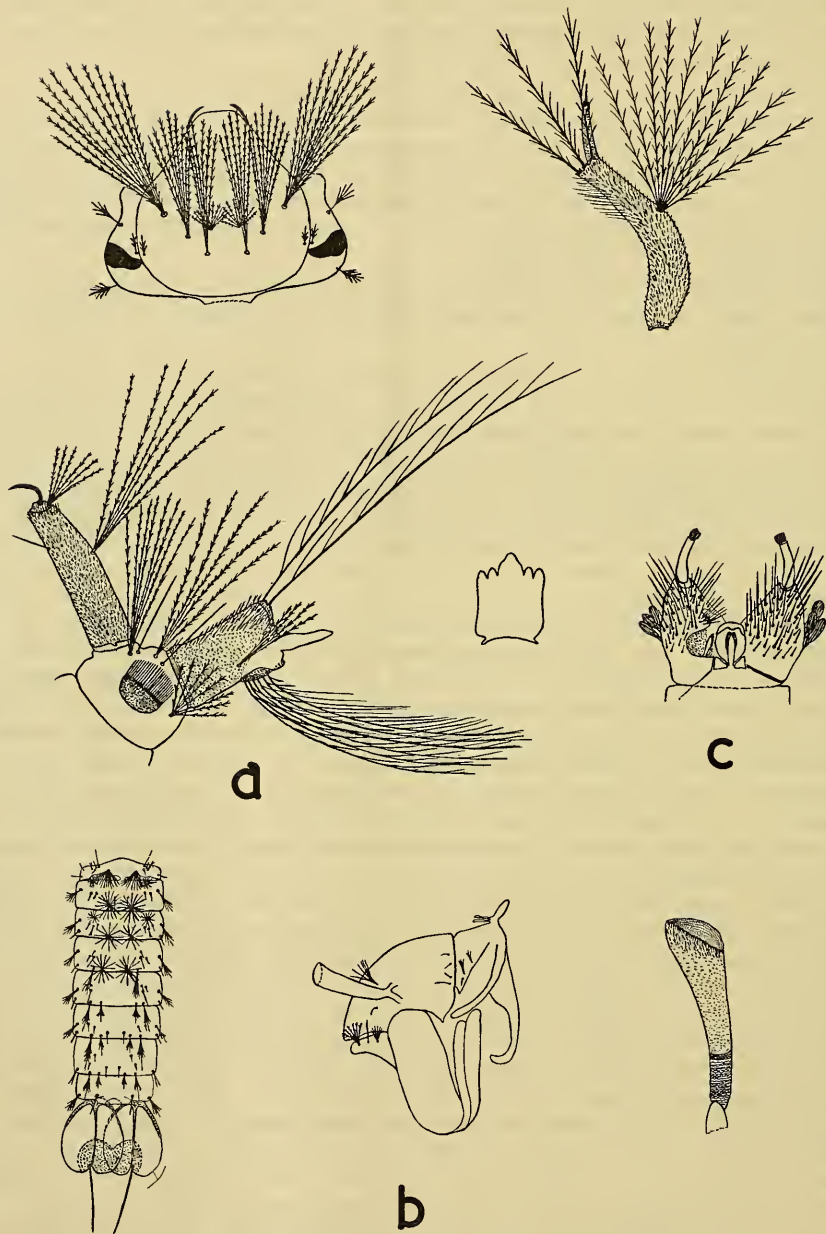


Fig. 1. *Aedomyia venustipes* (Skuse). *a*, head, mentum, antenna and terminal segments of larva; *b*, pupal abdomen (dorsal view), cephalothorax and trumpet; *c*, male terminalia.

white scales, with narrow rings of white scales near apex in fore and mid legs; on hind leg the narrow rings of white scales are about one-third of length of tibia from base. Tarsal segments with white and black scales, except fifth segments which are black-scaled, and third segment of hind tarsus which is white-scaled. Claws of fore and mid legs large and slightly unequal, the larger with a median tooth, the smaller simple; hind claws small, simple. *Abdomen*: Integument black. First tergite sparsely covered with cream, white and black scales; second to eighth predominantly black scaled; second with patch of white scales medially and apically; third and fourth with sub-apical patches of cream scales; third to seventh with few white scales on apical borders and laterally; seventh with three small patches of cream scales on apical border; eighth with scattered white scales and a dense patch of cream scales on apical border. Sixth and seventh tergites wider at apex than at base. Numerous hairs on all segments on apical border and laterally. Sternites black-scaled, with extensive mottling of white scales, particularly on second to sixth. *Terminalia* (Text-fig. 1, c): Coxite stout, about one and a half times as long as width at base; fine setae on coxite smallest near base, with longer setae laterally and ventrally; broad scales, longitudinally striated, laterally on coxites. Style about half length of coxite, expanded just above base, curved and tapering on apical half; terminal appendage about one-fifth length of style, comb-like and chitinized. Tenth sternite chitinized. Phallosome simple. Basal lobe small, well separated, with stout setae.

*Males*: The series of six males does not show much variation. In some specimens there are sub-erect white scales on vertex between the eyes, and the white scaling anteriorly and basally on femora is more extensive. Some specimens have paired pre-apical patches of white scales on third, fourth and fifth tergites. Bristles on lateral lobes of scutellum reduced to seven. Wing length 3.6-3.9 mm.

*Re-described Female.*

Differs from allotype male as follows: Palpi about one-fifth the length of the proboscis. Antennae about two-thirds length of the proboscis. Some erect white scales in front of erect cream scales on vertex. White scales dorsally on anterior margin of scutum prominent. Pre-alar bristles reduced to about 10; 10-12 upper and 8-9 lower mesepimerals. Wing length 3.5-4.0 mm. Tarsal claws of all legs small and simple. Second to seventh abdominal tergites with white scales laterally; fourth to eighth with cream scales laterally on apical border; eighth smaller than other tergites, and with dense patch of cream scales on apical border. Second to seventh sternites chiefly white-scaled, eighth mottled with black and white scales. Ninth tergite not well developed; cerci small.

*Females*: The series of six other females does not show much variation. In one specimen, the band of white scales on apex of proboscis is absent, and the area from which they are absent is lighter than any other parts of proboscis.

*Larva* (Text-fig. 1, a). Length 6.2-6.8 mm.; pale green, except for the light brown head, siphon and saddle. *Head*: About three-fourths as long as broad. Antenna long, curved, about as long as head, clothed with fine hairs; tuft well developed, with 10-14 branched plumose hairs about length of the head; three very long apical plumose hairs of approximately equal length, and one stout terminal spine. Clypeal spines curved slightly inwards, strong and pointed. Head hairs A, B and C in an oblique row, with D a stellate tuft lying anterior and slightly medial to C. A consists of 9-11 long, dark, heavily plumose hairs about the length of the head; B of 8-9 plumose hairs about three-quarters length of A; C 6-8 plumose, nearly as long as A; D is a stellate tuft of nine finely frayed hairs; *e* short and 4-branched; *f* short, 5-branched. There is a short 4-branched hair just below base of antennae as conspicuous as *e* and *f*. Ocular hair single and simple. Mentum with one large median tooth and two lateral teeth. *Thorax*: Prothoracic hairs 1-3 dark, plumose, about twice length of thorax; 4 and 6 about 3 times length of thorax; 5 and 7 greatly enlarged to about 5 times length of thorax; 8 very short, with about 4 branches. Meso- and meta-thoracic dorsal and dorso-lateral hairs dark, plumose, and about 5 times length of thorax. *Abdomen*: Lateral hairs on all

segments dark and plumose. On first and second segments they are about 3 times length of segment; on third to seventh segments about twice length of segment. Lateral comb arises as a single row of 20 long, slender, pointed spines from the posterior margin of a chitinized plate. Pentad hair 1 with 5-8 branches, heavily plumose; 2 single and simple; 3 with 5-6 branches, heavily plumose; 4 single, with 4-5 fine branches near apex; 5 with 8 finely plumose hairs. Siphon of medium length, somewhat curved and tapering; index from 3.6 to 4.8, mean 4.2; covered with short, soft hairs, not enlarged on any part. Tracheae very narrow. Ventrolateral tuft of 6 long, plumose hairs arising about two-thirds of length from base; dorsolateral hair single, simple; a pair of strong curved terminal hooks, and tufts of 6 plumose hairs on siphonal valves. No pecten. Saddle complete, covered with short, soft hairs, with a patch of longer hairs dorsally. Saddle hair tuft of 4 plumose hairs almost as long as the saddle. Dorsal sub-caudal hairs very long, branching dorsally from about one-quarter of length from base. Anal papillae short, about half length of saddle, moderately pointed. Ventral brush of 6 multiple tufts, arising from a grid, each single, with branches on one side only.

Description based on 6 larvae from Woodside, Victoria.

*Pupa* (Text-fig. 1, b).—General coloration brown. Length 7-8 mm. *Cephalothorax*: Darker pigmented areas around base of trumpet and medially on metapostnotum. Trumpet about four times as long as greatest width, narrow at base; opening oblique, fringed with small hairs near apex; base dark, with toothed area extending to about one-third of length of trumpet. *Abdomen*: Pigmentation darker on segments 1 and 8. Float hairs dendritic, with about 15 branches. Lateral hairs of segments 8 with 5 branches, short and simple. Paddles oval, with conspicuous midribs, and pigmented areas near apices; margins smooth; paddle hairs long, about width of paddle, single and simple.

Description based on three pupae from Woodside, Victoria.

*Eggs*: The eggs are unknown. None have been collected in the field, and no females in captivity have laid eggs.

*Distribution*: NEW SOUTH WALES: Elizabeth Bay, Sydney (Skuse, 1889); National Park (Mackerras, 1937); probably Narrabeen, according to Lee (1944). VICTORIA: Bairnsdale (29.iv.1954); Box Ridge (17.iii.1954); Darriman (14.ix.1953, 16.ix.1953, 5.xi.1953, 10.xii.1953); Giffard (30.iv.1953, 8.xii.1955); Won Wron (26.vi.1953, 10.xii.1953, 14.xii.1953, 5.xi.1953); Woodside (23.xii.1952, 8.i.1953, 10.i.1953, 3.ii.1953); Yarram (12.ix.1954, 19.x.1954, 10.iii.1955, 8.xii.1955); Ouyen (1.v.1955); all collected by G. W. Douglas; Melbourne (18.xi.1925), G. F. Hill.

### *Biology.*

This species is not common. It was first collected from a temporary roadside pool at Woodside, in January, 1953, but has not been found in temporary pools since. The high rainfall of late 1952 in Gippsland filled many roadside depressions, and these contained water until late in the summer of 1953.

The larvae and pupae are found chiefly in permanent water swamps, stock dams in the open, and forest dams and pools in the Gippsland region. Forest dams, sunk to provide water for fire-fighting, and now well vegetated, are common breeding places in late spring and summer. The Gippsland Plains, where most specimens were collected, have an annual rainfall of about 25 inches; but larvae were also collected on 1.v.1955 from Lake Timberoo, a channel-fed lake about 15 miles south west of Ouyen in the Victorian Mallee, where the annual rainfall is about 12 inches.

The larvae are usually difficult to find, on account of their pale green coloration and their habit of remaining amongst vegetation below the water surface. They can frequently be collected with a net placed deep in the water and drawn up slowly through the vegetation, particularly through water milfoil (*Myriophyllum* sp.). They frequently wriggle backwards on the collecting net. When placed in collecting jars, most larvae drop to the bottom of the jar and rest on their backs. Occasionally some rise to the surface, whilst others can spend long periods amongst the suspended vegetation without rising. Some larvae were held for about three months in jars without vegetation, and

frequently stayed below the surface for long periods. This species does not appear to have special structures to obtain oxygen from plants.

The pupae are usually collected amongst surface vegetation, often in the deepest parts of the water body. They invariably come to the surface, and are often difficult to disturb when on the surface. They move through the water rapidly, like a tadpole, with their tails out behind them. The paddles have pigmented areas which are very conspicuous whilst the pupae are in the water.

Larvae and pupae have been collected throughout the year, but appear to have breeding peaks in spring and summer. The occurrence of small numbers of larvae in many places, often in association with *Anopheles annulipes* Walk., suggests that single eggs are laid rather than egg rafts.

Adults have not been collected in the field, although numerous attempts have been made to attract them to man and animal bait during field studies on myxomatosis. Caged adults feed readily on sugar solution and raisins after emerging. On one occasion females attempted to pierce the skin of the forearm, but the proboscis bent every time, and the skin was never pierced. The resting adults lie close to the surface they are on, and the legs are placed close to the body, giving a very streamlined appearance. When released in a large room, the adults are capable of very fast flight.

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